

# Psittacosis in Man and Birds

DONALD J. DEAN, D.V.M., M.S., JAMES LIEBERMAN, D.V.M., M.P.H., ROBERT M. ALBRECHT, M.D., M.P.H., PAUL ARNSTEIN, D.V.M., GEORGE M. BAER, D.V.M., and WILLIAM B. GOODRICH

**I**N UPSTATE New York psittacosis became reportable in 1932. From 1932-1951, 15 cases, many of nonpsittacine origin (1, 2), and one death were reported, an average of 0.75 case per year. A marked increase in the sale of parakeets in New York, as elsewhere, followed the relaxation on November 15, 1951, of the Public Health Service's restrictions on the interstate shipment of psittacine birds; a concomitant increase in human psittacosis followed. From 1952-1960, 104 cases of psittacosis and one death were reported in New York State, exclusive of New York City, an average of 11.6 cases annually (table 1). Practically all cases followed exposure to parakeets.

Studies were made under generally comparable conditions in 1955 and 1962. Our report of the 1955 study summarizes the prevalence of psittacosis in commercial parakeet populations fed unmedicated feed and quantitates the risk to persons exposed to such birds occupationally in pet shops and in the home. The 1962 study documents the decrease in the prevalence of psittacosis in birds given chlortetracycline in feed continuously for a minimum of 15 days before shipment by the wholesaler. The re-

sults support the premise that the incidence of psittacosis was reduced in birds, thus minimizing risk to man.

## Birds on Nonmedicated Feed, 1955

A commercial bird population was studied in the tri-city area of Albany, Schenectady, and Troy; illness was evaluated in persons occupationally exposed to parakeets in 18 variety and pet shops and in the households of persons who purchased parakeets. Purchasers of psittacine birds and their families were followed for 2 months after purchase and the occupationally exposed groups, for 4 months.

Physicians and hospitals were advised of the study by the respective county or city health departments. The names and addresses of persons purchasing birds were recorded at time of purchase and forwarded once a week to the New York State Department of Health. The de-

**Table 1. Reported cases of psittacosis in New York State, exclusive of New York City, 1932-51 and 1952-60**

Year	Number of cases	Year	Number of cases
1932-33	2	1952	9
1934-35	0	1953	6
1936-37	3	1954	15
1938-39	0	1955	19
1940-41	0	1956	20
1942-43	3	1957	8
1944-45	2	1958	11
1946-47	0	1959	7
1948-49	3	1960	9
1950-51	2		
Total	<sup>1</sup> 15	Total	<sup>2</sup> 104

<sup>1</sup> Average per year: 0.75.

<sup>2</sup> Average per year: 11.6.

*Dr. Dean is assistant director, laboratories for veterinary science, division of laboratories and research, Dr. Albrecht, director of the office of epidemiology, and Mr. Goodrich, bacteriologist, division of laboratories and research, New York State Department of Health, Albany. Dr. Lieberman, Dr. Arnstein, and Dr. Baer were at the time of the studies on full-time loan to the division of laboratories and research from the Communicable Disease Center, Public Health Service. Dr. Dean, Dr. Lieberman, Dr. Albrecht, and Dr. Arnstein participated in the 1955 study; Dr. Dean, Dr. Baer, and Mr. Goodrich, in the 1962 study.*

partment sent each purchaser a letter stating the purpose of the investigation and requesting that all suspicious illness in the household be reported for 2 months following purchase, either by telephone or by returning the self-addressed stamped postal card enclosed with the letter.

Persons reporting illness but not under the care of physicians were visited by members of the study team. Attempts were made to obtain both acute-phase and convalescent-phase serums from each patient; when this was not possible, one or more convalescent-phase serums were collected 3 or more weeks after onset of illness. To report no illness, bird owners simply returned the postal card 2 months after birds were purchased; the return date was stamped on each card. Purchasers not replying received second and third requests. Finally, illness in the non-responding group was assessed by sampling.

#### **Bird Population**

From January 17 to May 20, 1955, 77 shipments containing 2,778 parakeets were received at the 18 shops from four wholesalers. None of the birds reportedly received medically treated food or water either before or after delivery. Seventy-one (92.2 percent) shipments were from a single source in New York City, and 6 (7.8 percent) were from three wholesalers outside New York State. An attempt was made to isolate the psittacosis agent from dead birds submitted by the stores and by purchasers. (Examinations for *Bedsonia* were made by Dr. Robert E. Kissling (3), Communicable Disease Center, Public Health Service, Atlanta, Ga.) Of 46 dead parakeets submitted, 37 were suitable for laboratory examination; *Bedsonia* was isolated from 19 (51.4 percent). These 19 birds were obtained from the New York City wholesaler and from two of the other three suppliers.

#### **Household Exposure**

Birds were purchased by 2,677 persons, representing 2,667 households. The population at risk was estimated at 8,561 on the basis of the 1950 census of 3.21 persons per household (4). Sixty-eight percent (1,832) of the households cooperated voluntarily.

Illness was reported in 117 of the 1,832 responding households. Six persons who became

ill less than 5 days following purchase were excluded. The remaining cases consisted of 85 persons with symptoms compatible with psittacosis and 26 with obviously unrelated illness, including gastroenteritis, streptococcal infection, measles, mumps, ethmoiditis, prickly heat, shingles, trench mouth, and nervousness.

One or more blood samples were obtained from 45 of the 85 persons with illness suggestive of psittacosis. Forty (69 percent) of the samples were from the 58 persons 8 years of age or older. Only five were from the 27 children younger than 8, since it was difficult to obtain permission to draw blood from young children.

#### **Serologic Examinations**

Serologic examinations were made by Mrs. Gladys Gnesch and Miss Elinor Whitney, division of laboratories and research, New York State Department of Health.

Serums from six persons reacted in the complement fixation test with psittacosis antigen (5) (table 2). Most of the serums were also tested by complement fixation with Q fever and influenza A and B antigens and for the presence of cold hemagglutinating antibodies (6,7). Evidence of infection with Q fever and influenza B was not observed. Six persons over 7 years of age, whose serums were negative for psittacosis, had serologic evidence of infection with influenza A virus. A demonstrable rise in titer was observed in acute-phase and convalescent-phase serums from four persons; the other two gave high but dropping titers indicative of recent infection. One person had a cold hemagglutinating antibody titer of 32 and another a titer of 128. The illnesses of these eight persons did not differ significantly from those of the six with psittacosis.

The illnesses of the six persons with serologic and clinical evidence of psittacosis (table 2) varied from mild to moderately severe and did not differ significantly from those of persons with suspected psittacosis whose serums were negative in the complement fixation test. Recovery was uneventful in all cases, with or without medical treatment. Isolations of *Bedsonia* were not attempted. Four patients owned more than one bird, and birds owned by five of the six patients died following illness.

Two patients, L.D. and W.D., had five parakeets in a tightly closed house-trailer.

A 50 percent random sampling was made of the 845 persons and their households not reporting voluntarily. Telephone inquiries or visits to 421 of 423 persons in the sample revealed only one illness suggestive of psittacosis. Serum from this person, obtained 4 months after onset of illness, did not react in the complement fixation test. Unrelated illness was not reported in this group.

### Occupational Exposure

Forty-nine persons, mostly women, handled parakeets more or less regularly in the 18 retail stores. The length of employment varied from a few days to nearly 3 years; the average was 18 months.

The management of each store reported illness and absenteeism to the health department twice weekly throughout the 4-month study. Each illness was evaluated by the attending physician or by a member of the study team.

Early in the study blood samples from 39 of the 49 employees were tested with psittacosis

antigen for the presence of complement-fixing antibodies. Twenty-nine had titers of less than 10, and 10 had titers ranging from 13 to 71; titers of all but 3 of the 10 were 32 or greater.

Since the 10 persons with elevated titers denied prior illness during the period of employment, illness was probably inapparent or mild. There was no relationship between the presence of complement-fixing antibodies and the period of employment. Paradoxically, 10 cases of mild respiratory illness and one of bronchopneumonia in the 29 persons with titers of 10 or less were reported as occurring before the study. Blood was not collected after the study period.

During the study, five employees became ill with symptoms suggestive of psittacosis. One employee, absent for only one day, refused to give a blood sample. A second worker, with a titer of 32 before the study, had mild respiratory disease that persisted for 8 days. Three weeks after onset, the titer was 28, suggesting that illness was not due to psittacosis. The remaining three employees had both serologic and clinical evidence of psittacosis (table 2). Ill-

**Table 2. Persons in contact with psittacine birds and having illnesses diagnosed serologically as psittacosis, in an upstate New York area, 1955**

Name, age, and sex	Medical care <sup>1</sup>	Severity of illness	Duration of illness	Nature of illness	Complement fixation titer blood samples			Illness in birds
					1st	2d	3d	
<i>Household contacts</i>								
L. B., 56, f.....	Yes..	Mild.....	Few days..	Fever, headache, upper respiratory symptoms.	4	64	67	Yes.
S. B., 37, f.....	Yes..	Mild.....	3 weeks....	Mild respiratory symptoms.....	64	43	---	No.
W. D., 60, m.....	Yes..	Mild.....	4 days.....	Mild respiratory symptoms, rales.	257	( <sup>2</sup> )	---	Yes.
L. D., 60, f.....	Yes..	Moderate..	3 weeks....	Fever, cough, weakness, pulmonary consolidation.	344	( <sup>2</sup> )	---	Yes.
W. M., 24, f.....	No..	Mild.....	3 weeks....	Mild respiratory symptoms.....	55	46	---	Yes.
M. T., 84, f.....	Yes..	Mild.....	Unknown..	Upper respiratory symptoms, weakness.	515	( <sup>2</sup> )	---	Yes.
<i>Retail store employees</i>								
A. G., 27, m.....	Yes..	Moderate..	1 month....	Fever, headache, weakness, pulmonary consolidation.	129	64	55	Yes.
L. L., 45, f.....	No..	Mild.....	2-3 weeks..	Fever, headache, weakness, cough.	62	( <sup>2</sup> )	---	Yes.
F. S., 50, f.....	Yes..	Moderate..	4 weeks....	Fever, headache, weakness, scattered areas of pulmonary consolidation.	64	29	---	Yes.

<sup>1</sup> Broad spectrum antibiotics usually prescribed.

<sup>2</sup> Refused to give further blood samples.

ness varied from mild to moderate and was characterized by fever, headache, weakness, mild dyspnea, and cough. One person was hospitalized.

### Discussion

Many studies (8-11) have been made of the causal relationship between psittacosis in man and exposure to psittacine birds. The present work attempts to quantitate the risk to purchasers of pet birds and to retailers.

The nine cases of psittacosis diagnosed serologically and clinically represent one case for each 309 birds sold. Three cases occurred in occupationally exposed persons and six in the homes of purchasers. Since only 45 of the 85 suggestive illnesses occurring in the home were studied serologically, the attack rate of 0.7 cases per 1,000 in the 2-month period is artificially low. The rate for the group occupationally exposed in pet stores was 61.2 per 1,000 for the 4-month study. The results indicate that, as in exposure to ducks and turkeys (1, 2, 12-15), the risk of contracting psittacosis is greater among persons exposed occupationally.

Seventy-two percent of the cases of psittacosis-like illnesses and 77 percent of the unrelated illnesses received medical attention; most illnesses of moderate or greater severity were attended. Since physicians did not regularly request serodiagnostic tests or report cases, psittacosis is believed to be under-reported. When used, broad spectrum antibiotics may have suppressed antibody titers, thus further minimizing the incidence of the disease. The hazard to retailers and purchasers of psittacine birds was not sufficiently great to warrant banning the sale of parakeets but justified warning the public of the risk involved.

### Summary

A survey for psittacosis was conducted of 2,677 purchasers of parakeets, representing 2,667 households, and of 49 persons exposed to the same birds at the retail stores of origin.

Although psittacosis was presumably under-diagnosed, nine cases were diagnosed by clinical and serologic evidence, one case for every 309 birds sold or handled. Illness varied from mild to moderately severe. All patients re-

covered uneventfully with or without specific treatment.

Occupationally exposed persons were at greater risk than those exposed to birds in the home. Three cases of psittacosis occurred in 49 persons exposed to birds while working in retail stores, a rate of 61.2 per 1,000 for the 4-month period. Six cases occurred among the estimated 8,561 persons at risk in the households of bird purchasers, an attack rate of 0.7 cases per 1,000 for 2 months.

### Birds Fed Medicated Feed, 1962

Widespread use of medicated feed for the elimination or control of psittacosis in parakeets and other birds prompted reevaluation in 1962 of the potential hazard of psittacosis to man from caged birds, principally parakeets.

Thirty-three stores in the tri-city area of Albany, Schenectady, and Troy cooperated in the study; 22 were chain stores and 11, privately owned and operated. From March 19 through July 18, 2,980 birds were received (1,752 parakeets, 961 finches, 188 canaries, and 79 of miscellaneous species). Twenty-three stores handled 2,767 (92.8 percent) of the birds, all obtained from a single wholesaler in New York City known to distribute only birds treated with chlortetracycline by the methods developed by Meyer (16, 17). In the 1955 study, this supplier was the source of 92.2 percent of the birds. The remaining 10 stores purchased 213 (7.2 percent) of the birds from at least four additional suppliers. Two stores regularly fed birds chlortetracycline in feed; the other eight used chlortetracycline in water whenever birds sickened. Use of feed containing antibiotic by suppliers of the 10 stores is suspected but not known.

All birds either dead on arrival at the stores or dying after receipt were collected daily and examined at autopsy for lesions suggestive of psittacosis as recommended by Meyer. These numbered 139 (58 parakeets, 48 finches, and 33 canaries). Films stained by Macchiavello's method (18) were examined for evidence of *Bedsonia* when the lesions observed were even remotely indicative of psittacosis. An attempt was made also to isolate *Bedsonia* from each bird by mouse inoculation with 10 percent sus-

pensions of the brain and of the combined liver and spleen. Suspensions were inoculated intracerebrally in 0.03 ml. amounts and intraperitoneally in 0.5 ml. amounts into groups of five or more 10- to 12-gram albino mice of the Albany standard strain. Broth salt solution containing 10 percent normal horse serum served as the diluent. Streptomycin and penicillin were used to control bacterial contamination in some specimens; 250 units of streptomycin and 0.25 mg. of penicillin per milliliter were added to the diluent. Mice were examined at least daily for not fewer than 14 days. Streptomycin, penicillin, and horse serum in the concentrations used did not inhibit *Bedsonia* when combined with equal volumes of infective mouse brain suspensions containing psittacosis *Bedsonia*, incubated at room temperature for 1½ hours; infectivity was determined by intracerebral titration in young adult mice.

Blind passages, usually on the 13th and 14th days, were made in each instance in similar numbers of mice inoculated intracerebrally or intraperitoneally or by the combined intracerebral-intraperitoneal routes with 10 percent suspensions prepared from the brains or livers and spleens of sacrificed mice previously inoculated with tissue suspensions of the bird under examination. A second similar blind passage was made in five mice approximately 14 days after the first subpassage, with brain material inoculated intracerebrally and suspensions of the combined liver and spleen inoculated intraperitoneally. Film preparations of all mice showing lesions of the liver or spleen after death or when sacrificed were examined by Macchiavello's method for evidence of the psittacosis agent.

Psittacosis *Bedsonia* was not demonstrated in film preparations made directly from birds or from mice inoculated with suspensions of brain or of the combined spleen and liver of birds or mice used for subpassage. Attempts to isolate psittacosis *Bedsonia* by mouse inoculation tests failed.

## Discussion

Abundant evidence exists that chlortetracycline and related antibiotics are effective in reducing or eliminating psittacosis infection in parakeets and other birds. The most widely

used method of treatment in caged birds is that of Meyer (16,17), which is reported to cure frank disease and eliminate *Bedsonia* from latently infected birds. Strains of the psittacosis *Bedsonia* resistant to antibiotics apparently have not yet been encountered.

The major supplier of the birds in this study initiated the mass use of antibiotic-treated feed in late 1958 and early 1959. Medicated feed was originally used intermittently. However, since late 1961 and early 1962 feed treated with chlortetracycline had been given continuously to all birds for a minimum of 15 days. Estimated daily intake is 2.5 mg. based on daily consumption of 5 grams of feed containing 0.5 mg. of drug per gram of feed.

Since the major difference between parakeet and other bird populations studied in 1955 and 1962 is the widespread provision of medicated feed in 1962, the investigations tend to confirm the efficacy of such treatment in minimizing or eliminating psittacosis.

Although sufficient time has not elapsed since the industry began mass use of antibiotic-treated feed to evaluate the effect on human disease, reported cases of psittacosis in upstate New York may have decreased somewhat. Whereas an average of 11.6 cases was reported annually from 1952 through 1960, only 5, 3, and 2 cases were reported for 1961, 1962, and the first 6 months of 1963.

One need not accept the principle that chemotherapy will be universally effective in eliminating psittacosis *Bedsonia* from infected birds. Not only is intake of medicated food or water difficult to control and development of resistance to drugs a possibility, but treated birds are susceptible to infection when the drug is discontinued. Provided antibiotic-resistant strains do not develop, however, our results suggest that the risk to man of contracting psittacosis from the species studied is lessened when treatment of birds is carried out adequately. In view of the negative results in birds, no further studies in man were undertaken.

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## New Editor of Public Health Reports

Keith Kost was named editor of *Public Health Reports* on January 1, 1964, J. Stewart Hunter, Assistant to the Surgeon General for Information, has announced. Mr. Kost succeeds Marcus Rosenblum, who has edited the principal journal of the Public Health Service since 1955. Mr. Rosenblum has been appointed Associate Special Assistant to the Surgeon General for Scientific Information. He has also been named secretary of the Board of Editors of *Public Health Reports*.

Mr. Kost, a native of Oakley, Kans., received his B.S. degree in journalism from the University of Kansas in 1950 and his master of public health degree from Columbia University School of Public Health and Administrative Medicine in 1960. He served overseas with the 44th infantry division, U.S. Army, in World War II. Mr. Kost worked as a newspaper editor in Kansas and Idaho prior to assuming the post, in February 1956, of chief of health education and training for the Idaho Department of Health in Boise, a position he held until his recent appointment. Mr. Kost is married and resides with his wife and two children in Bowie, Md.